Nestlé
Good food, Good life

THE NESTLÉ Agriculture FRAMEWORK

January 2024

PURPOSE OF THIS DOCUMENT

The following Framework describes Nestlé's corporate vision for agriculture as a central building block for more regenerative food systems. 'Regenerative agriculture' is defined as an outcome-based farming approach that protects and improves soil health, biodiversity, climate, and water resources while supporting farming business development, according to the Sustainable Agriculture Initiative Platform.

We aim to clearly frame the key challenges that must be addressed through various interventions and to highlight major opportunities to change the way we grow food.

This Framework is meant to be a playbook, containing common principles and techniques that may be used in different combinations, depending on specific local conditions and crop type. It is not meant to be a rulebook. For certain ingredients, including dairy and coffee, we have also issued more detailed guidelines.

In addition to defining our approach to regenerative agriculture, this document also describes our implementation strategy at market level. It considers the main drivers for local initiatives aimed at transitioning to new farming practices.

Its primary audience is Nestlé's internal agriculture and sourcing community; however, it can also be used with our suppliers to explain our approach and expectations.

01

INTRODUCTION

For over 20 years at Nestlé, our "Sustainable Agriculture Initiative" (SAIN) has enabled us to support hundreds of thousands of farmers to introduce more sustainable practices on their farmlands.

Through SAIN, we provided technical and financial support to farmers in our supply chain. In over 40 countries, our field agronomists have provided support, covering categories including dairy, coffee, cocoa, grains and vegetables. This has helped deliver more than 300 individual projects supporting the farmers Nestlé works with and their rural communities, and supported large-scale programs like NESPRESSO AAA, the NESCAFE Plan and the Nestlé Cocoa Plan. It delivered significant successes at local level and benefits to many farming communities, while contributing to implement practices aiming at reducing environmental impact.

Based on these solid foundations, and guided by scientific principles, we are now embarking on our next step. Using a broader and deeper approach, we are working with farmers around the world to support the transition to innovative, beneficial and highly effective regenerative agricultural practices. We recognize both the challenges and benefits to farmers, ecosystems, water and human health. We are here to help make this happen.

This aspiration is reflected in Nestlé's net zero roadmap, which includes a commitment to source 20% of our key ingredients from farmers adopting regenerative agriculture practices by 2025, and 50% by 2030.

Throughout this journey, we will continuously evolve our approach as the science improves, ensuring our actions align with the latest knowledge.

" The Food and Land Use Coalition estimates that regenerative agriculture is one of the ten transitions needed to transform food and land use."

02

SETTING THE SCENE

Why do we need to move towards regeneration?

The 20th century saw extraordinary population and economic growth, enabled by a revolution in agriculture. This delivered cheap food to many, but also contributed to an over-exploitation of natural resources and sometimes led to negative social impacts.

Consumers now increasingly aspire to eat and drink in a way that does not harm nature. Beyond just food production, agriculture can provide various additional services to society including environmental, health, social, cultural and leisure benefits. But the current approach to production mainly optimizes labor, capital intensity, economies of scale and margin per hectare without always considering the true cost to natural and human resources. We need an agricultural system that sustains and improves the use of resources, rather than degrades them. Climate and nature-smart agriculture will increasingly form the basis for success in the food and beverage sector.

Farming is under pressure on multiple fronts:

a. Gradual degradation of natural resources linked to conventional farming practices

Soils & soil health

Without healthy soil we would not be able to grow our food. In fact, it is estimated that 95% of our food is directly or indirectly produced on our soils. (1)

Soil is a fundamental asset. Soil health and fertility must be protected and restored.

Soil organic matter is an important measure of soil fertility. Unfortunately, there is extensive evidence showing it is declining, even in the world's most fertile agricultural landscapes. Change of land use and continued use of conventional farming practices are some of the main drivers of the loss of soil organic matter.

Take, for example, the Morrow plots in Illinois, USA: long-term research shows a decrease of 45% in soil carbon in this region over the last 100 years. Some of the most fertile soils in Northern France/Belgium are down to less than 2% organic matter content. This has negatively impacted soil health, which farmers compensate for by applying more synthetic fertilizers.

According to the FAO in 2017 "... soils have become one of the most vulnerable resources in the world. Soils are a major carbon reservoir..."

Soil erosion is a growing concern too: current soil erosion from agricultural fields is estimated to be 10 or 20 times (no tillage) up to more than 100 times (conventional tillage) higher than the soil formation rate. Some studies suggest that in 60 years the arable fertile layer may be exhausted.

Since 1961 the use of inorganic nitrogen (N) fertilizers has increased 9-fold. To fertilize soils sufficiently, there is a need to stabilize or reduce global nitrogen and phosphorous (P) fertilizer use, while simultaneously improving access to fertilizers in regions of soil nutrient deficiency. (1)

In addition to the above, soils play a key role in global climate processes, through the emission of three major GHGs: carbon dioxide (CO2), nitrous oxide (N2O), and methane (CH4). Depending on their condition, soils act as carbon sinks or net carbon emitters. Soil management practices can play a major role in affecting the dynamics of the flow of these gases.

Water

Water is an essential resource. Without water, plants cannot grow and ensure food security. Water is a renewable resource, but two crucial

challenges must be addressed to manage it correctly: the use/replenish balance; and where and when water is made available.

Since 1961, the use of irrigation has doubled and now, around 20% of total crop land is irrigated. Agriculture accounts for approximately 70% of global freshwater use increasing to 90% in some developing countries. Some 1.2 billion people live in areas where severe water shortages and scarcity create challenges for agriculture, with very high drought frequency for rainfed crops and pasture areas or very high-water stress experienced in irrigated areas. (2)

In addition to water scarcity, the other main management challenge is the impact of agriculture on water quality. Overuse of fertilizers, poor manure management and unregulated run-off can lead to local contamination of aquifers and river streams, and eutrophication. Depending on their characteristics, such as solubility, half-life and mobility, the excessive use of pesticides may also contaminate surface water, groundwater and soils and may accumulate in ecosystems. This may affect biodiversity by killing plants, insects, and aquatic organisms and could lead to an accumulation of pesticides in the food chain.

Numerous studies show the impact of excessive pesticides use; a USGS study reported more than 143 different pesticides and 21 transformation products in groundwater. (3) In a UK survey of 3500 sites, 100 pesticides were detected.

The agricultural sector, through appropriate agronomic practices, has a huge opportunity to help transform global water stewardship practices in the coming decades, helping meet the needs of an increasing population.

Biodiversity

According to a recent report from IPBES, "Nature and its vital contributions to people, which together embody biodiversity and ecosystem functions and services, are deteriorating worldwide." (4)

Ecosystem services are critical to humanity and affect all aspects of people's lives, including food and medicines. 70% of the drugs used to treat cancer are either naturally derived or built from synthetic substances based on natural equivalents. In theory, over 7000 edible species can be used for food, but only 150-200 are commercially cultivated. Four plant species provide 50% of the world's energy needs. Food production systems have been oversimplified to increase their productivity, but now there is a need to diversify them in order to increase efficiency and resilience.

"Resilience to extreme weather events is also linked to on-farm biodiversity, a typical feature of traditional farming systems." (5)

Unfortunately, local varieties and breeds of domesticated plants and animals are disappearing around the globe. It is estimated that 25% of animal and plant species are threatened (4), and 85 % of wetlands have already been lost. IPBES also estimates that around 1 million wild animal and plant species face extinction, many within decades. (4)

The use of pesticides / herbicides and the use of highly productive varieties has contributed to tremendous increases in yields, (x 3 since 1960), providing food to an expanding global population. Their overuse has, however, also contributed to the deterioration of ecosystems. Loss of genetic diversity reduces the natural resilience of production systems to attacks by pests and plant diseases, threatening global food security.

Despite the fact that 75% of major crops are dependent on pollinators, wild pollinators have declined in abundance and diversity in regions, including in North America, according to the IPBES report. This is because of factors such as land-use change, intensive agricultural management, and pesticide use. (6)

While synthetic pesticides help increase crop yields, protect farmer incomes and safeguard food security, a change of practices and innovations are needed to support the reverse of biodiversity loss. Through our regenerative agriculture work, we are aiming for a reduction of synthetic pesticides throughout our supply chains. Our approach includes requiring that certain pesticides are not used in field applications (Annex 4 of our Nestlé Responsible Sourcing Core Requirements).

We also aim to phase out progressively other pesticides and controversial practices (like the use of glyphosate as desiccant). In line with the need to protect pollinators, we will also prioritize actions on insecticides.

b. Climate change and the environmental impact of some conventional agricultural practices

Land interacts continuously with atmosphere. Agriculture is a significant contributor to greenhouse gas (GHG) flows: it represented around 23% of total net global emissions from 2007-2016. 13% of CO2, 44% of methane and 81% of nitrous oxide emissions originated from agriculture, forestry, and other land use activities. In addition, new research suggests that due to global warming, soils' carbon emissions will increase by 9-12% in the years to come. This will be triggered by higher plant growth, in turn boosting microbial decomposition of organic matter and the resulting emission of CO2.

Agriculture is, at-once, a contributor to and a victim of global warming. Extreme weather events, droughts and changes in local weather patterns all severely impact farmers. It is therefore important to increase the resilience of production models, especially to droughts.

Farming practices - especially appropriate soil management, the introduction of cover crops and agroforestry - can reduce the net GHG emissions, using the power of plants to trap carbon from the atmosphere.

There is ongoing scientific debate about the exact quantification of this potential (7, 8, 9). We will strive to help farmers capture more carbon in soils and plants, to achieve a maximum “carbon sink” effect.

c. Population growth, land use change and the importance of yield

Worldwide population is expected to exceed 9 billion by 2050. This translates into a need to produce 50% more food by 2050 (FAO 2018), even as the land available for agricultural production remains a finite resource.

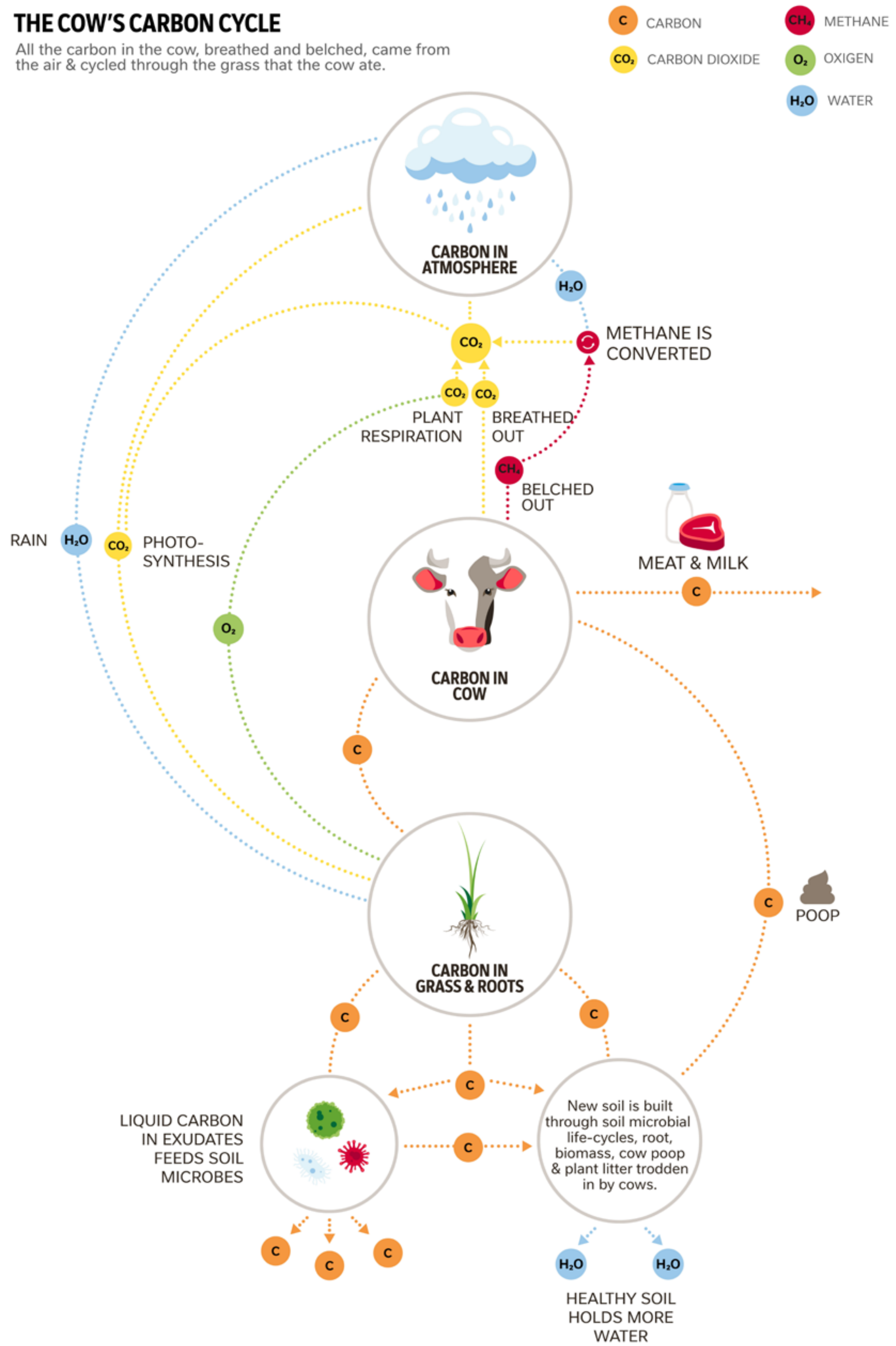
Between 1961 and 2000, the global population more than doubled. At the same time, per capita food production increased by 24%. This was mostly enabled by almost tripling crop yields. In Europe and in the US, cereal yields have more than tripled over the last 60 years. This has resulted in a significant reduction in arable land use per capita (0.45 to 0.25 ha/cap). (1)

Looking ahead, maintaining and increasing productivity per ha is key to preventing further deforestation and land use change as well as the associated increase in GHG emissions and reduction of natural habitat. In addition, higher yields can improve farmer income. Plus, a higher yielding crop produced with the same inputs generates less GHG per ton.

The need for sustainable intensification remains more pressing than ever, and if professionally managed, this can contribute to increased production and carbon sequestration while reducing emissions. (5)

CARBON SEQUESTRATION

With the help of grazing animals, carbon is taken from the air by plants and pumped into the soil providing energy for soil microbes to build humus and store carbon

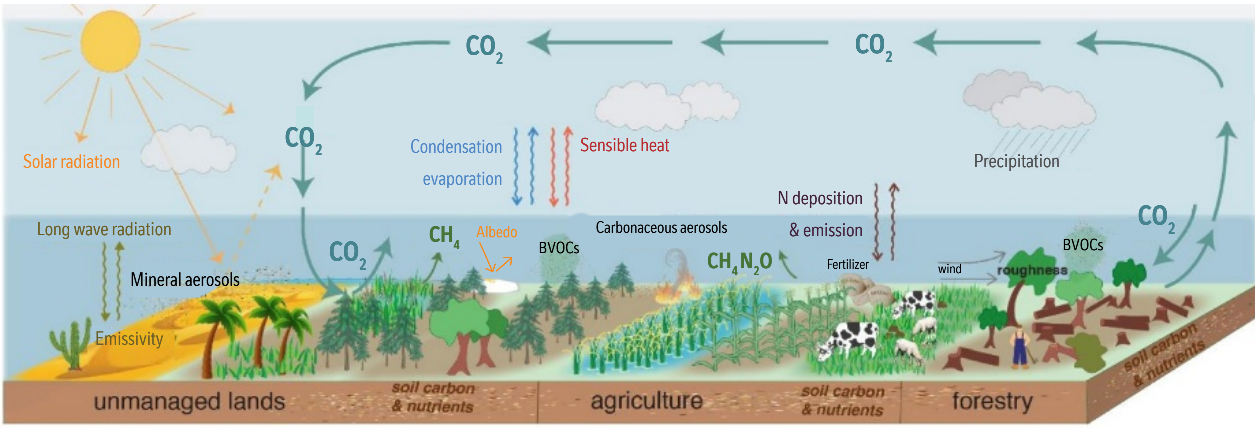


03

THE NESTLÉ MODEL FOR REGENERATIVE AGRICULTURE

We are guided by agroecological principles and practices

There is currently no collectively recognized and approved precise definition for regenerative agriculture. As a concept, it intends to bring together the best of a number of approaches (conservation agriculture, sustainable intensification, climate-smart farming, agroecology, low input farming, precision farming ...), into the ambition to not only maintain but actively help improve and restore natural resources.



The structure and functioning of managed and unmanaged ecosystems that affect local, regional, and global climate. Land surface characteristics such as albedo and emissivity determine the amount of solar and long-wave radiation absorbed by land or reflected or emitted to the atmosphere. Surface roughness influences turbulent exchanges of momentum, energy, water, and biogeochemical tracers.
Land ecosystems modulate the atmospheric composition through emissions and removals of many GHG's and precursors of SLCFs, including biogenic volatile organic compounds (BVOCs) and mineral dust. Atmospheric aerosols formed from these precursors affect regional climate by altering amounts of precipitation of radiation reaching land surface through their role in cloud physics.

03 THE NESTLÉ MODEL

It aims to conserve and restore farmland, its ecosystem and its key resources including soil, biodiversity, and water, delivering benefits to farmers, the environment, and society as a whole. These benefits include capture carbon in soils and plant biomass; improvements to soil health and soil fertility; reduced use of agro-chemicals and reduce net emissions of GHGs.

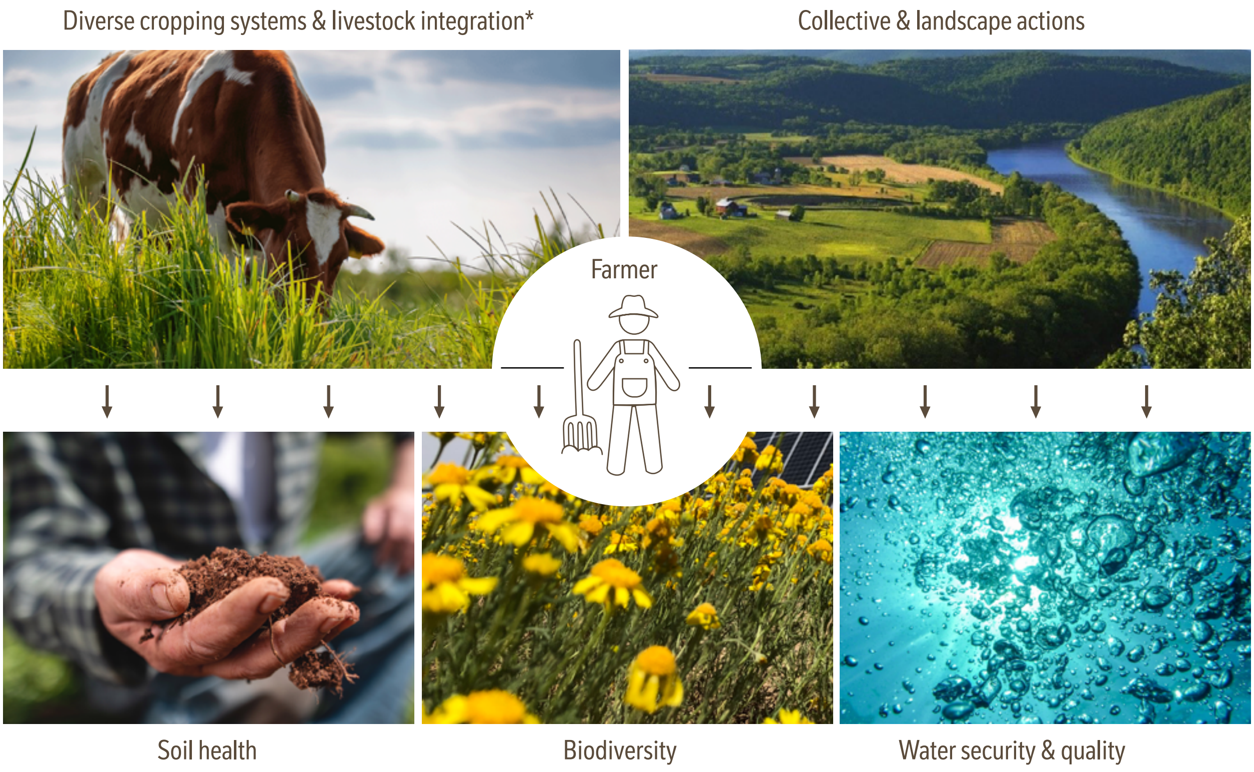
Consequently, it also aims to decrease farmer dependence on synthetic inputs, improve the resilience of farmland to climate change, and benefit farmer livelihoods.

The absence of a formal definition of regenerative agriculture allows for pragmatism – adapting practices to local environmental conditions and the fostering of innovation. Transitioning to regenerative farming is a knowledge-intensive journey, requiring collaboration with farmers and further research.

a. The holistic model

Nestlé's comprehensive regenerative agriculture model clearly defines the three key resources of any agricultural system: soil, water, and biodiversity as the focus of the collective restoration efforts. Priority actions are the use of more diverse production systems, the integration of livestock and actions across landscapes: all supported by science-based agronomical and agroecological principles. The integration of livestock provides an opportunity to improve nutrient cycles and optimize returns on land and biomass, while minimizing environmental impacts. Most importantly, farmers are at the center of our model. They are the ones managing resources and making decisions on practices per to their specific individual circumstances. Collaboration with farmers and other relevant stakeholders is key to a just transition. Where the journey to regenerative agriculture initially generates risks or additional costs, farmers and other stakeholders need support in the journey towards a just transition.

THE HOLISTIC MODEL:



* Whenever possible and relevant

b. Soil: a nexus to protect and restore - feed the soil, not the plant

Soil is an agronomical nexus where all the key natural resources needed to grow plants and produce food interconnect. Improving soil health brings numerous collateral benefits such as better water availability. One critical driver of the performance of agroecological systems is soil organic matter (SOM). SOM is any material produced by living organisms (plant or animal) that is returned to the soil and goes through the decomposition process. It consists of a range of materials: from the intact tissues of plants and animals to a decomposed mixture of materials known as humus. Percentage of SOM closely correlates to the content of carbon in soils. As this tends to change slowly, it is important to ensure representative sampling and long-term recording when measuring SOM.

Enhancing SOM can deliver greater nutrients to crops from plant decomposition, improving fertility and reducing the need for synthetic fertilizers. It develops biological activity by providing more substrate to the micro flora/ fauna, which will convert it into nutrients (N, P, S). SOM improves the physical properties of soil, including the structure of soil aggregates and porosity. This increases water retention, infiltration and drainage capacity. It may improve water use efficiency, leading to lower irrigation needs. A more porous structure also contributes to better soil aeration, and the reduction or even elimination of water logging. This is vital for all aerobic processes, and soil fertility. Root system growth also improves, allowing better exploration for water and nutrients. In addition, it leads to a reduction in run-off and erosion of the arable layer.

SOM is directly linked to soil organic carbon (SOC) content levels (SOM ~ 1.7 x SOC, depending on e.g., climate, geology, water). Increases in SOM allow for enhanced carbon sequestration and the mitigation of GHG emissions.

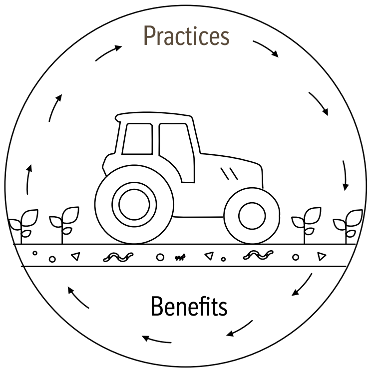
There is unanimous agreement that the gain in SOM and its contribution to GHG mitigation in any given soil is largely determined by the quantity of organic matter returned to the soil. (10)

Soil science is complex, and other considerations are also important, including pH, cation exchange capacity, microbiota activity, C/N ratio, %SOM/clay and structure. Consequently, soil assessment and mapping leveraging existing information and community initiatives, should be part of the initial steps for implementing regenerative agriculture. This helps set a clear baseline, identify any issues, and develop expertise.

POTENTIAL BENEFITS TO SOIL CONSERVATION:

c. The interconnection of practices and benefits

Agroecological systems are complex and interdependent. Interventions can deliver multiple benefits, with various impacts on the resources we aim to restore. This interconnectivity guides and supports our holistic vision for agriculture, the actions that we prioritize and the trade-offs that might be required depending on the local context.



HOLISTIC APPROACH: Each practice can benefit several resources

	Impact: • Minor •• Moderate ••• Major	Soil	Water	Biodiversity	GHG mitigation
	Cover crops	•••	••	••	•••
	Diversified crop rotation	•••	—	•••	••
	Mulching & crop residues cover	•••	••	•	•••
	Minimum tillage	•••	••	••	•••
	Organic fertilizers	•••	•••	••	•••
	Integrated nutrient management	•••	•••	••	•••
	Irrigation technology	•	•••	—	•
	Riparian buffers	•••	•••	•••	•••
	Intercropping	•••	•	••	•
	Agroforestry & silvo-pastoral systems	•••	•	•••	•••
	Hedgerows & green buffers	•••	•	•••	•••
	Integrated pest management & bio-controls	••	•••	•••	—
	Precision farming	•	•••	••	••
	Manure storage & process	••	•••	—	•••
	Herd management	—	—	—	•••
	Integrated pasture management & grazing strategies	•••	••	•	•••

d. Main regenerative agriculture practices

This document does not list all the possible interventions that farmers can introduce in detail. However, we highlight below some major practices that can contribute to restoring agroecological systems, which must be adapted to the local context.

1. Cover crops

Cover crops are grown in the period between two cash crops, when fields would otherwise lie fallow. The primary purpose of cover cropping is to protect soil. It also helps add biomass to the soil, which can increase soil organic matter and thus soil carbon sequestration. Cover cropping is one of the most important regenerative agricultural practices. It prevents soil erosion, improves soil fertility (as green manure) to suppress weeds and to control diseases and pests. Cover crops can consist of mixtures of different plant species, including legumes to fix nitrogen in the soil. A very wide range of plant species including cereals planted off-season (rye, oats, barley, wheat), ryegrass, legumes such as clover, alfalfa, peas, beans, lupin and vetch, as well as buckwheat, sun hemp, radish, brassica, turnips, and rapeseed may be used as cover crops. Before sowing the new cash crop, cover crops are either ploughed under, cut or ground. Some cover crops can also be used for fodder and grazing.

Choosing the appropriate cover crop requires local knowledge and, above all, a clear idea of the purpose of each variety selected: whether its pivot roots that fragment the soil deeper, dense root systems that enhance microbiological activity, the creation of above the ground biomass, pollinators attraction, fixing nitrogen, the creation of a dense cover to protect from heavy rains etc.

2. Diversified crop rotation

Crop rotation is the practice of planting different crops sequentially in the same plot over a number of years, avoiding planting the same crop in the same field year after year. A simple rotation might involve two or three crops, and complex rotations might incorporate a dozen or more. Usually, rotations aim to include complementary crops, such as legumes to add nitrogen to the soil before or after a crop that extracts high quantities of nitrogen. Ideally, rotations include legumes, deep-rooted crops, and high-residue crops. Diversified crop rotations may have important benefits. Farmers experience improved yields, better nitrogen management, better resistance to disease, as well as healthier soils and less soil erosion. Crop rotations reduce the pressure from specific weeds and diseases more successfully than monocropping or narrow rotations because different plant species have different levels of susceptibility to pests and diseases. This disease sensitivity is an important parameter to consider when selecting cover crop species as it allows the breaking of disease and pest infestation cycles. Whenever possible, integrating livestock farming in crop production systems enables wider crop rotations through integration of fodder crops and grazing mixtures.

3. Mulching & crop residues cover

Mulch is any type of plant residue or organic material that is spread or kept on the surface of the soil as covering, for example straw or cut cover crops. There are several benefits to this practice: prevention of weed growth, conservation of soil moisture, prevention of soil erosion, and stabilizing soil temperatures. This practice is also especially important for increasing soil organic matter and consequently carbon sequestration.

4. Minimum or conservation tillage

Minimum tillage is a farming system in which soil tillage is reduced to its absolute minimum, in order to minimize soil disturbances. In one of its most advanced forms, a cash crop is sown directly, under the cover crop in place and the seeds are directly deposited into a soil that has not been ploughed or intensively tilled. This requires specific machinery but avoids/minimizes the use of herbicides. Conservation tillage practices include: ridge tillage, whereby crop rows are planted on top of ridges that are scraped off for planting and rebuilt during the growing season; strip tillage, whereby only the seed row zone is prepared; mulch tillage, a form of reduced tillage in which plant residue is retained and spread out but the soil is tilled just prior to planting; and tillage along contours of a slope to prevent soil erosion.

5. Organic fertilizers

This can include any organic matter that is used as fertilizer: animal manure but also compost and green manure (residues of cover crops). Manure and organic fertilizers contribute to soil fertility by adding organic matter and plant nutrients, and feeding the soil fauna, which is essential for good soil health.

6. Irrigation technology

Nestlé Pakistan: implementation of new generation soil moisture sensors

There are different irrigation technologies, which differ in the terms of water use efficiency. Surface or flood irrigation uses gravity to distribute the water, which then seeps into the soil of the field. This method tends to use too much water and to saturate the land. Sprinkler irrigation mimics natural rainfall. Water is distributed through a system of pipes and is then sprayed into the air through sprinklers that break up the water into small droplets. Drip irrigation distributes water through tubes and emitters. It allows water to drip slowly to the roots of plants through narrow tubes equipped with emitters. Subsurface irrigation does the same but below the surface of the ground. This system is best adapted to areas that are arid, hot, windy, or have sandy soil types, because it minimizes water evaporation. The latter two methods in particular contribute to water savings.

Another important driver is the management of the irrigation itself, including when to irrigate, which quantity to use and at what frequency. These considerations can be better informed using soil moisture sensors, and plant stress level sensors. Paired with digital data processing, this helps maximize the impact of water provided to the soil and crops. Such technologies are developing rapidly and will make a significant contribution in the future.

7. Riparian buffers

These are strips of land along waterways or water bodies. They should feature permanent vegetation cover (grass, bushes, hedges, trees) and occupy a sufficient width (at least 5-20m) to protect water resources from pollution by agrochemicals, fertilizers and soil sediment. Riparian buffers protect the land adjacent to waterways from soil erosion, and provide habitats for fauna, including pollinators and other beneficial insects.

8. Integrated nutrient management

Nestlé Thailand: soil analysis field training to optimize fertilization by Nestlé agronomist

This means fertilization based on a plan that considers the type of fertilizer; the method of application; the fractioning; and the quantity, calculated according to the needs of the crops. The calculation accounts for nutrients provided by organic manure and by the previous crop. It should be based on recent soil analysis and site characteristics. Incorrect application of fertilizers can damage soil biodiversity and soil health, lead to pollution of water resources and GHG emission increases. Nutrient use efficiency should be measured and benchmarked (see section on KPIs).

9. Intercropping

Intercropping means growing several crops simultaneously in the same field. This can be done by mixing the seeds of different crops. It can also be achieved by growing them apart in different rows, thus protecting the soil in-between the rows, enhancing the root systems and sequestering carbon in the soil. Intercropping can contribute to the production of higher total yields when crop species are selected to complement each other and not compete for the same resources. This has benefits for soil health, soil protection and shading, micro-climate, irrigation and biodiversity, and generates additional income for the farmer. Biocontrol of pests is more efficient through maintaining a broader variety of beneficial insects.

10. Agroforestry & silvo-pastoral systems

These are systems in which trees, hedgerows and agricultural/horticultural crops and/or livestock are produced on the same piece of land. These systems provide co-benefits, including additional sources of farm income, carbon sequestration in trees and soil organic matter, protection against wind erosion, improved water management and provision of habitats for beneficial insects, pollinators, birds, and other species. Local knowledge of the ecology and land requirements must be considered in the selection of trees and crops for optimal results. Shade trees in coffee and cocoa, or alleys of trees planted in a field within another cropping system, are common and beneficial examples.

11. Hedgerows, green buffers

Hedges or hedgerows are lines of closely-spaced shrubs or regularly-pruned trees, planted and maintained to form a barrier. They are often located at field boundaries but, depending on local climate and soil conditions, it can be beneficial to plant hedgerows within the field to maximize impact. Hedges can serve as windbreaks to protect crops and soil. They offer interesting habitats for natural

predators and can also provide organic material for mulching. They can deliver similar benefits as those provided by agroforestry systems.

12. Integrated pest management (IPM) and biocontrol

IPM focuses on managing pests and diseases through a combination of methods. It is based on field monitoring, rather than the sole use of synthetic pesticides to destroy pest populations. This includes pest identification, monitoring pest populations and damage levels. Based on this, IPM applies economic thresholds to decide when to implement pest control actions. Pest and disease issues are minimized through a combination of biological, cultural and mechanical methods and chemical pest control. The approach also includes the use of organic pesticides. Biocontrol of pests and plant diseases uses other organisms, such as beneficial insects, natural predators, and specific plant species to control the targeted pests. Measuring the level of implementation of IPM and, in particular, measuring the outcomes can be complex. IPM requires training agricultural advisors and farmers and the adaptation of the approach to the crop and region. It is often advisable to devolve implementation to local experts and research organizations.

13. Precision farming

The basic underlying principle of precision agriculture is to adjust, as precisely as possible, the application of agrochemicals to the variability of a field or a crop. Typically, it includes variable rate application of fertilizers or pesticides depending on soil type or differences observed in the field (e.g., crop nutrient status, pest pressure). It is generally based on the use of GPS technologies that provide exact positions within a field, as well as mapping soil/crop conditions.

Precision farming technologies can include parallel driving systems in tractors; section control; variable rate application of fertilizers; pesticides in machines; or the use of digital farm decision support tools and optical sensors. It also includes receiving precise data to make better decisions such as when to irrigate, using soil moisture sensors. In dairy, data collection encompasses animal health and welfare parameters, breeding, feed characteristics like dry matter and nutrient content and using handheld NIRS (near infrared spectroscopy) devices.

14. Manure storage & application on the field

Different manure storage and application systems have different impacts on the environment. They are key ways of controlling CH4 and N2O emissions on a dairy farm.
As a general rule: the farm must have sufficient manure storage capacity to ensure that manure application takes place at the appropriate time, depending on the vegetative cycle of crops and their needs, (i.e., when crops are present to absorb nutrients provided by the manure) and not just to free-up manure storage capacity.

- The manure storage system should never leak; any run-off must be captured.
- The collection system should ensure quick and complete collection, avoiding run-off and methane emissions.

Best practices include covered storage, separation liquid/solid (to reduce methane production) and production of biogas from manure. Regarding on-field application as fertilizer, its contribution to crop nutrition must be integrated into fertilization calculations. Application practices should aim to eliminate losses, leakage into water resources and the formation of nitrous oxide.

15. Herd management

This aims at optimizing the productivity of herds of farm animals. It includes monitoring and management of animal health and age, adapted animal welfare practices, feeding based on calculated requirements and fertility management. Using herd management software facilitates and optimizes decision-making through more precise and real time data collection (see above precision farming).

16. Integrated pasture management & grazing strategies

Grass is highly beneficial to soil fertility and soil carbon sequestration. Pasture should be integrated in dairy farming systems as much as possible. This should be combined with a good rotational grazing strategy to optimize the use of the on-farm grass/base ration production. This can include grazing methods such as adaptive multi-paddock, rotational grazing, mob grazing and integrated crop-livestock systems. Mob grazing uses large herds to graze the lands, sometimes at higher grazing intervals. Pastures should be maintained as multispecies areas, including grasses and legumes.

17. Landscape-scale collaboration

The regenerative agriculture approach may look beyond individual farm level. Such landscape-scale actions can include the protection or rehabilitation of natural resources contributing to higher resilience of farming systems and delivering several other benefits (health, GHG emissions, welfare, profitability …) to local communities. Examples include: the reforestation of watershed areas and hilltops; protection of waterbodies and groundwater resources or rehabilitation; and regulated usage of communal land. Green corridors, diversity of production systems or agroforestry projects aimed at fostering biodiversity are much more impactful when considered at a regional level. Farmers should be encouraged and rewarded for participating in community actions at landscape level.

04

THE IMPLEMENTATION STRATEGY

We adapt to local conditions and needs

a. Guiding principles

None of the 17 interventions described in the previous chapter should be considered as a universal must-do solution regardless of local conditions. In agriculture, one size does not fill all. However, a couple of generic principles do guide implementation strategies, to ensure projects are:

i. **Pragmatic and adjusted to local conditions:**
Agronomy is a location-based science, so solutions must be adapted to local situations and constraints. We aim not to exclude any locally relevant approaches, and value innovation and creativity.

ii. **Results-focused, driven by measurable outcomes:** Focusing on how we measure impact will help deliver more tangible outcomes, rather than simply pushing a standard set of practices regardless of local results.

iii. **Beneficial to the farmers:**
The transition and risk-taking phase towards more regenerative outcomes must be dealt with carefully. Support may be needed if the transition initially creates risks or additional costs.

iv. **Collaborative and science-based:**
Localization of practices and implementation in collaboration with farmers and farmers' associations, local authorities, NGOs and national agriculture research institutes are key success factors.

v. **Carried out at landscape level wherever relevant:**
Individual farms are the building blocks of a regenerative food system. But interventions at landscape level are needed to help deliver additional impact and restore natural resources. This must be implemented by taking into account complex interactions across landscapes–from those taking place globally to more localized interactions affecting the use

of resources. Landscape approaches require collaborative action between farmers, communities, organizations and industry (see details in chapter 3, point 17). Water is a topic that must be considered holistically. Water is a shared resource used by different stakeholders; wherever water scarcity is a threat, it must be considered at watershed level. (specific details are described in annex)

vi. Tailored to smallholder needs: Smallholders play a major role in global food supply systems (small farms <2 ha represent 84% of the total number of farms, operate only around 12% of all agricultural land and produce roughly 35% of the world's food" (11)). Their specific circumstances must be assessed with care. Regenerative agriculture practices can have a greater positive impact on the resilience, economic stability and profitability of smallholder farms when compared to larger landholders. However, smallholder farms are also often operating at a higher risk level than larger-scale, commercial operations and, consequently, require tailored solutions for incentivizing and implementing regenerative agriculture practices. Approaches targeted to smallholders should have a stronger focus on low-cost implementation strategies, use of local inputs, integration of traditional knowledge, and establishment of innovative extension models.

Therefore, integration of a tailored smallholder approach into a project requires:

- The development of a distinct set of KPIs for measuring outcomes that are specific to smallholder systems,
- The creation of educational/training programs to increase the technical capabilities of smallholders in both basic and alternative agronomic practices,
- The development of support mechanisms to give them access to more efficient technologies, including innovative technical solutions,
- The implementation of community actions to impact wider society.

In intensive farming systems, the general aim is to reduce the use of synthetic farm inputs, for smallholders the intensification of production through the smart use of inputs to increase local food supply and farmer income is often the first necessary step of any intervention. With productivity and income increase, reduced yield variability, stronger resilience is a major outcome of the introduction of regenerative practices with smallholders who are often more vulnerable to shocks, climate events and price fluctuations.

b. The roadmap

In our direct sourcing districts we develop reference farms in collaboration with local partners (including academic, research, institutional partners). The main purpose of these farms is to:

- Validate, at local level, the expected impact and benefits of the practices introduced,
- Learn what the key drivers and barriers are for scaling-up,
- Demonstrate feasibility for implementation on other farms.

In parallel, understanding the baseline from which farmers can start applying regenerative practices is crucial to driving the relevant interventions and measuring progress.

Regenerative agriculture is a comprehensive approach to farming which considers all resources required and impacted. Depending on the local context and constraints, resources may have a different priority level, potentially requiring trade-offs. Therefore, a solid initial mapping of the local situation (a minima farming practices, and depending on needs: soil conditions, hydrogeological studies, pest and disease prevalence) is an effective way to make sure that the right challenges will be addressed in the right sequence, and the right opportunities identified.

From this baseline we have developed an implementation framework with 3 main pillars, summarized in the below chart.
More details are provided in the internal guideline “Nestlé regen ag implementation guide”.

TECHNICAL	COLLABORATIVE	FINANCIAL
Adoption of practices at farm level	Awareness creation, engagement and training of stakeholders	Ensuring competitive solutions and creating demand
Initial mapping resources & practices	Expertise, partnerships, incl. R&D	Funding models, internal & external
Engage farmers, reference farms	Communication strategy	Benchmarking
Deploy, measure & report	Wokshops & advocacy	Ensure long term demand

c. Tools and metrics

To improve we need to be able to measure change. Another common challenge in regenerative agriculture is the lack of common metrics and indicators for assessing changes over time.

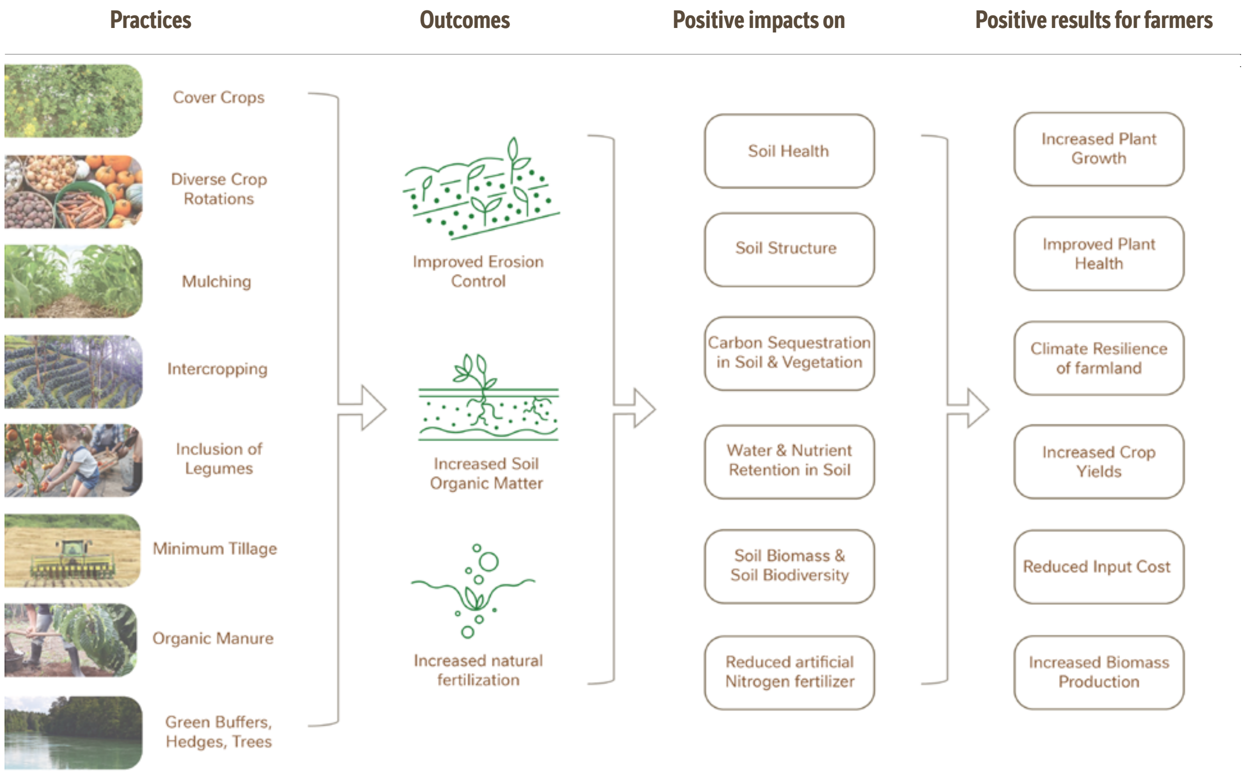
> A lack of quantitative evidence of the benefits of these approaches will convince neither farmers, consumers, nor policy makers to adopt and promote them (12).

Measuring starts at the individual farm level with a baseline regenerative agriculture farm assessment, repeated in the years that follow, as practices evolve and results become more visible. We aim to measure outcomes as much as possible. Indeed, as approaches and indicators need to be tailored to local situations, it is important to assess whether practices actually deliver the expected outcome. This avoids taking a dogmatic approach, frees up the creativity of local farmers and scientists, fosters changes in practices and speeds up the implementation process.

Changes in soil health and the natural environment usually take several years. In the short term, we need indicators based on practices with immediate outcomes. We also acknowledge that, in a number of areas, result indicators must either be created or improved by the scientific community in order to be usable at scale. Therefore, we encourage the application of a combination of practices and impact-based indicators to monitor the progress of farms on the regenerative journey (see full dashboards in annexes). As measurement technologies evolve rapidly, we will keep a close eye on the latest scientific developments to stay at the forefront of innovation in this critical area.

IMPACTS OF REGENERATIVE AGRICULTURE:

Practices, expected outcomes, impacts and results



i. Farm assessment tool

To understand the implementation level of different regenerative practices and collect the above-mentioned data, we have created a crop specific farm assessment tool. The initial assessment sets a baseline, i.e., the extent to which current practices are already in line with regenerative agriculture. It helps to identify improvement opportunities and to create a roadmap. The follow-up assessments will then show developments versus the initial baseline and farm roadmap. Aggregated results of farm assessments per crop and/or region are the basis of Nestlé's internal and external reporting versus objectives and commitments.

These assessments also allow us to collect the primary data needed to estimate the farms' GHG footprint. We can also collect several other impact metrics that will reflect the actual farm situation, regarding water, biodiversity etc. As many regenerative agriculture practices have a significant impact on GHG emissions and removals, regular reassessment of practices will allow us to monitor the evolution of the GHG footprint.

ii. Grading system

The transition towards regenerative practices is not a one-off project. It is a knowledge-intensive journey on which farmers embark, and then continuously seek improvement. Therefore, we created a 3-level scale to reflect this progression and acknowledge the need for a dynamic process rather than a box-ticking static approach. The thresholds are based on our specially designed farm assessment tool. (details of requirements and KPIs are provided in annex 2)

1. **Engaged** - Farmer has embarked on the Regenerative Agriculture journey
2. **Advanced** - Farmer is well established in Regenerative Agriculture, several practices well implemented
3. **Leading** - Farmer is seen as an expert in his/her region, impacts of practices are demonstrated through farm level indicators

iii. Indicators & Dashboard

The following minimum indicators are measured through the Nestlé Regenerative Agriculture Farm Assessment Tools. (see tables below). These indicators measure the implementation level of key regenerative practices, short term outcomes and some of the longer-term desired results. An initial assessment sets the baseline, helps identify priority areas for improvement, and based on this, future assessments capture the changes.

Practice-based KPIs

TOPIC	KPI
Soil cover	Number of months when soils are covered through crops, cover crops, plant residues or mulch (on an annual basis)
Cover crops	% of crop land planted with cover crops
Crop rotation	nbr of different crops grown over 3 years on the same piece of land (including cover crops)
Minimum tillage	% of crop land managed with minimum tillage
Farming practices	% of farmland under specific practices (practices to be defined per cropping system & region)

Result-based KPIs

TOPIC	KPI
Soil organic matter	Soil organic matter
Fertilizer productivity	Fertilizer productivity (crop yield per kg N applied); Crop yield per per kg N from artificial fertilizer
Habitats	% of habitat areas on the agricultural land (hedges, tree alleys, flower strips, green belts, riparian buffers)
Riparian buffers	% of watercourses with riparian buffers
Pesticides	# of applications of synthetic pesticides on the Nestlé crop

The farm assessment also monitors crop yields, which allows rapid reaction and correction of practices if this key indicator does not go in the right direction during the implementation of regenerative agriculture implementation. For dairy and perennial crops, additional specific KPIs are considered (see the reference document on KPIs).

The farm assessment tool carried out by a Nestlé or third-party agronomist is not the only way to monitor these indicators. There are technologies that can be used in addition, to ease the data collection or to provide further evidence when required for verification, carbon reduction or other metrics. For example, different organizations have started using remote sensing through satellites to provide evidence of farming practices such as the use of cover crops, zero tillage, crop rotation or riparian buffers. Other technologies are being developed to ease the measurement of soil organic matter and various soil health parameters, for example, automated soil sampling, digital sensors, or combinations of remote sensing with on the ground assessments. Nestlé investigates and pilots such solutions where they are available and make sense. Local teams are encouraged to follow local developments.

Monitoring a large number of farm level indicators can be time and resource intensive. Therefore, in a typical regenerative agriculture implementation project, we develop reference farms to pilot new practices and demonstrate impacts (see chapter 4.b). In these reference farms, we recommend monitoring additional KPIs, that are more detailed and specific, to verify whether the desired impact is being achieved. In particular, the carbon footprint must be estimated, using the Cool Farm Tool or other tools indicated by Nestlé.

Going beyond

Beyond the above, additional KPIs are optional and depend on the specific objectives of the local project. They may cover soil, water quantity and quality, and biodiversity. For soil health, they can include pH, nutrient levels, C/N ratio, % SOM/clay, water storage and infiltration capacity. These are especially relevant in reference farms. Regarding biodiversity, the Nestlé Farm Assessment Tools measures impacts on biodiversity in an indirect way, including the number of different crops in the fields or the percentage of habitat areas on farm. While these are valid indicators, a more direct impact on biodiversity, such as soil microbial biomass and the variety or number of earthworms, or quantity and variety of pollinators can also be measured. This can be pioneered on reference farms to provide a proof of concept.

The Annex 3 “going one step beyond” summarizes recommendations for additional tools and measurements provided by the organization “The Nature Conservancy” via its collaboration with Nestlé on the design of our regenerative agriculture model. Depending on local needs and priorities, we encourage market teams to identify focus areas for their initiatives and to pilot tools accordingly.

05

WHAT WILL SUCCESS LOOK LIKE?

Regenerative agriculture is a knowledge-intensive journey. Projects, initiatives, technologies, actions and metrics will evolve as science develops and new insights and innovation spread across the sector. Our vision is of a more sustainable agricultural approach that contributes to a regenerative food system. We aspire to help develop agricultural production systems where:

1. Soil organic matter increases every year, and agriculture acts as a net carbon sink
2. Water resources are not used beyond their replenishment rate at watershed level
3. Biodiversity increases continuously on farmland
4. Farmers decrease synthetic fertilizer use every year; and a majority of them use organic fertilizers
5. Farmers use less pesticides every year; and a majority use biological control methods instead
6. Farming is an economically attractive activity, and the average age of farmers decreases
7. Yields and return on farm investments continue to improve
8. Landscapes in key sourcing areas switch from monocropping approaches to more varied landscapes, including greater tree cover and more hedgerows
9. Crops are traceable to the farm or group of farms of origin
10. Consumers better understand and appreciate the contribution of farmer to society, and recognize Nestlé's contribution

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THE SPECIFIC CASE OF WATER

Where it matters, a watershed approach

A watershed (or river basin) is the area of land from which all surface run-off flows through a sequence of streams, rivers, aquifers and lakes into the sea or another outlet at a single river mouth, estuary, or delta. Surface water is the most visible, but groundwater is also important in most watersheds.

A watershed covers many different entities – farms, farmers, landowners, industry, habitation, people, conservation areas and regulators. Also important are ecological and biodiverse features that are not always formally protected or managed correctly. Actions by one organization impacts the others. Therefore, sustainable management of water resources requires interaction and cooperation, at watershed level, best achieved through ongoing stakeholder engagement.

In principle, water is a renewable resource (except when taken from aquifers that are not replenished, known as 'fossil aquifers'). Water is 'lost' if either more water is extracted than is naturally replenished every year, or if it is made unusable due to pollution. Good water stewardship is about ensuring water 'borrowed' from the watershed is returned to the natural environment for further safe use.

An important aspect of water stewardship at watershed level is to ensure water needs are shared equitably and sustainably between all users and the natural environment. The overall water balance of a watershed is defined by hydrogeologists who estimate each flow. Sustainable water management plans are then defined accordingly. This analysis means we can assess the relative importance of a every water usage, including agriculture, compared to the other natural and man-made flows in the region, helping identify risks and opportunities.

Larger commercial farms are more likely to have options available to overcome water scarcity by extracting water from wells or river streams. Smaller farms without these options (especially at family and subsistence scale) and the natural environment are more vulnerable to extremes of scarcity. Larger farms therefore should ensure they do not exacerbate these impacts. For example, pumping more water during a crisis may further decrease water availability for other users.

An advanced approach to water management at watershed level includes support for actions, via stakeholder engagement, to assist the more vulnerable, either directly via water provision projects, or indirectly through environmental improvement projects. Good water stewardship will protect and promote biodiversity, which in turn has a beneficial impact on farming, for example by promoting natural forms of pest control and pollinating insects.

Water management on and beyond the farm

Most water management activities take place on the farm. However, a watershed approach involves being aware of the potential impacts beyond the farm in terms of water volumes, water levels and water quality.

a. Water quantity: withdrawals ensuring replenishment

The largest use of water in agriculture is by far for crop irrigation. Crops may be rain-fed (via 'green' water), irrigated with 'blue' water or managed through a combination of both. Irrigation can impact water resources, when it uses water pumped or diverted from surface or groundwater. These impacts include:

- Over-pumping sources with lower water levels nearby (surface water and groundwater),
- Collective negative impacts of over-pumped sources over a wide area,
- Lower water levels increasing the energy needed and costs of pumping (at farm level and for other users), and at worst may dry up streams, wetlands, and wells.

Water efficiency is highly dependent on the irrigation method chosen. Generally, flood irrigation and over-application of water to land should be avoided, with drip irrigation often considered the best option. However, there may sometimes be beneficial impacts from irrigation losses, such as recharging aquifers or excess water reaching nearby small farms. An understanding of the wider hydrological impacts of a chosen method in the local and social context is important.

In dry environments, dependent on irrigation, more thirsty crops will result in greater impacts on water resources.

b. Water quality: protect from contaminations

Pollution from a farm can cause downstream issues in the watershed. The number, size and concentration of farms in a watershed can exacerbate these risks. This is especially true for diffuse pollution such as eutrophication and the contamination of groundwater with pesticides and nitrates.

Drivers and causes of water contamination are numerous, including:

- Over-irrigation in hot, dry climates can lead to soil salinization due to high evaporation rates.
- Pesticides and fertilizers may pollute ground and surface water via run-off and infiltration.
- Pollution of water courses by fertilizers causes 'eutrophication', especially excessive N and P that lead to growth of algae (often creating algal blooms) which in turn use up the oxygen needed by other organisms. In some cases, high algae concentration becomes toxic to wildlife, preventing further use as drinking or even recreational water.
- Regarding livestock, the main risks come from animal waste, especially where they gather or are kept together in enclosures or buildings. The drinking point where animals gather or a high concentration of livestock in other areas concentrates run-off and can enter watercourses directly or via drains, including where animal slurry is used as fertilizer.

  The main risks include organic waste washed into watercourses, which uses up the oxygen needed by wildlife, and fecal contamination of drinking water sources. Groundwater may also be polluted. Another emerging concern is the contamination from veterinary pharmaceuticals excreted in livestock waste.
- Water used for general farm management must be collected appropriately to avoid aquifer and river contamination. The main risks come from cleaning chemicals and animal waste.
- Poorly managed sanitary/domestic wastewater is a pollution risk. Latrines and septic tanks may contaminate groundwater and nearby surface water (for example, with nitrates) and present a micro-biological health risk to drinking water sources, including nearby water wells.
- Poorly managed run-off from rain events can cause soil erosion and rapidly carry pollutants into sensitive watercourses. Buffer strips and field margins are important management techniques.

c. Key areas for action

Strategic area	Actions	Benefits	Example of specific projects
Optimise water efficiency **"more crop per drop"**	Drive the adoption of agricultural practices optimising water productivity	Reduced run-off, reduced evapotranspiration, better use of rainfall by the plant, less water used per ton of raw material produced	Introduce mulching, cover crops, plant nutrition, conservation tillage, terracing, soil organic matter conservation, intercropping ...
	Introduce crops/ varieties better adapted to local hydric condition	Less water requirements	Switch sourcing to less water demanding crops Introduce varieties more resistant to drought
	Reduce wastes & losses of raw materials	Less water consumed per ton of raw material produced and used	Reduce post-harvest losses
	Collect & store rain water	Better use of rainfalls, more rainwater made available for irrigation and on farm use	Build on farm water storage, create local reservoirs
	Drive adequate plant nutrition	Higher photosynthesis efficiency, reduced evapotranspiration, less water used per ton of raw material produced, less leaching of chemical fertilisers	Enrich K+ fertilisation Reduce NPK chemical fertilisation
Reduce water withdrawal **"use less"**	Introduce more efficient irrigation technologies	Less water withdrawn from aquifer, rivers ... for irrigation & farm management per ton of raw material produced	Eliminate leaks Introduce drip irrigation, advanced irrigation management, water sensors ...
	Improve on-farm water use		Improve cleaning in dairy palor Improve cleaning of green coffee beans
protect & replenish watershed **"protect"**	Build buffer / green strips, protect sources and rivers banks	Reduce run off to rivers, maintain water in the watershed area, increase replenishment rate of natural reservoirs, reduce soil erosion, improve quality of water returned to watershed	Create grass strip along rivers, or on the borders of the field
	Revegetate degraded areas		Reforest unused and degraded areas
	Treat farm effluents	Good quality water discharged in water bodies to replenish watershed	Improve manure management Treat green coffee washing water
	Reconnect natural water bodies	Increased replenishment rate of local Watershed watershed	Increase surfaces of wetlands, restore natural drainage network

FARM ASSESSMENT TOOL

Perennial crops

Themes	Subthemes	Q-No	Question
Soil	Soil Cover (Living Root in Ground)	1.01	Do you apply mulch or grow cover crops on your land?
		1.02	What is the percentage of crop land planted with cover crops (grown in the field min. 2 months)? (acreage with cover crop/total arable and permanent acreage x 100)
		1.03	What is the percentage of crop land with application of crop residues, mulch, grass clipping, straw, etc. ? (acreage with application/total arable and permanent acreage x 100)
		1.04	On average, for how many months the soil is covered by an annual crop, a cover crop and mulch (i.e. a crop other than coffee, cocoa or other perennial trees)?
	Erosion Assessment	1.05	Do you implement any form of erosion control (e.g. terracing, contour planting, windbreaks, soil coverage)?
		1.06	What is the percentage of agricultural land with severe water and wind erosion (signs: siltation, sheet-rill-gully erosion, flying dust; as estimation)?
	Soil Health Assessment	1.07	Do you conduct a soil analysis (at least once every 3 years or more frequent)?
		1.08	What is the soil organic matter level in your soils?
		1.09	Soil pH
		1.10	Do you compost your farm residues (formal composting process)?
	Crop Nutrition	1.11	Percentage organic fertiliser vs total fertiliser applied (organic/ total applied x 100)
		1.12	Do you calculate your fertilizer plan on the basis of crop nutrient requirements (e.g. recent soil analysis, productivity, crop cycle)?
		1.13	Do you follow the 4R principles (Right Amount, Right Source, Right Time, Right Place) when applying fertilizers?
	Fertilizer Productivity	1.14	Synthetic Fertilizer Productivity (FP) = Y/F (Yield/ Synthetic Fertiliser applied)
Biodiversity	Crop Protection	2.01	Are you applying chemical insecticides and/or fungicides in your farm?
		2.02	Do you follow the IPM principles for crop protection? (IPM includes pest identification; monitoring and assessing pest numbers and damage; economic treshould for when management action is needed; preventing pest problems; using a combination of biological, cultural, physical/mechanical and chemical management tools)
	Weed Managment	2.03	Are you applying chemical herbicides in your farm?
		2.04	What is the percentage of cropland with synthetic herbicide application? (Acreage with synthetic herbicide control/ total acreage x 100)
		2.05	Which integrated weed management practices do you apply?
	Crop Diversity and Resilience (Renovation)	2.06	What is the percentage of coffee and/or cocoa treestock with new improved variaties (disease/ pest /drought tolerant)?
	Crop Carbon Footprint	2.07	Is the Carbon Footprint of the farm/dedicated supply chain known?
		2.08	What is the Carbon Footprint of the farm or the dedicated supply chain (in MT CO2e / MT GC)?
	Land Use	2.09	Number of years farm has been in use
	Biodiversity management	2.10	What is the percentage of farmland with biodiversity infrastructures (windbreaks, hedges, border trees, natural habitats, green belts, riparian buffer, etc)?
		2.11	Do you keep bee hives in your farm (own bee hives or termporary during flowering season)?
	Agroforestry	2.12	What is the percentage of agriculture land dedicated to agroforestry (non-crop trees like native trees, shade trees, nitrofixing trees)?
		2.13	What is the percentage of shade cover on the permanent cropland (coffee and cocoa)?
		2.14	Number of different shade tree species (excl. commercial tree species)
	Land Intercropped	2.15	What is the percentage of permanent crop land (coffee, cocoa, etc.) intercropped with multiple commercial crops?
		2.16	Number of different commercial species (crops) in the farm
Water	Irrigation	3.01	Which irrigation practices do you apply?
		3.02	Do you monitor soil moisture or tree condition (flower bud development, leaf wilting) before applying irrigation?
	Water Poducivity	3.03	Water footprint (l/kg/yr) for total crop produced (both irrigation and wet processing combined where applicable)
	Waterways	3.04	What is the shortest distance between field (fertilizer and pesticide application area) and the water body?
		3.05	Are the riparian buffer strips covered with natural vegetation (hedges, bushes, trees, etc)?
Farmer	Record keeping	4.01	Do you keep farm records (income, expenses, inputs, etc)?
	Profitability	4.02	Do you calculate your profit and loss?
		4.03	Estimated household income from the farm (USD/yr)
	Standard of Living	4.04	Have you experienced a cash flow shortage period during the last year?
	Training and Competencies	4.05	Have you received training on Farm Economics and Business Skills?
		4.06	Have you received training on Regenerative Agriculture Principles and Practices?

In addition, dedicated tools have been tailored for dairy and annual crops.

MOVING ONE STEP AHEAD

Additional tools recommended by The Nature Conservancy (TNC)

Nestlé and The Nature Conservancy (TNC) initiated a strategic and technical collaboration with the aim of enhancing Nestlé's global framework for regenerative agriculture. Within this scope of work, global and regional experts from TNC provided inputs on the Nestlé Regen Ag Framework, assessment tools, approaches, and guidance documents.

This Annex explains additional more sophisticated and focused KPIs and tools , that can help to develop specific areas further. We strongly recommend Nestlé Market Teams to consider using these additional tools depending on the specific objectives of local initiatives.

Specific KPIs

Regionalization of KPIs and target values: KPIs need regional specificity – this is especially important for quantitative KPIs subject to specific climate or soil constraints (e.g., buildup of SOM, cover crops). Markets are encouraged to set regional targets for KPIs and to add context specific KPIs.

Soil health measurements: Target values for soil indicators are highly dependent on local context (climate, soil type) as well as the choice of analytical method and sampling design. The following soil health indicators are recommended.

- Basic: Soil Organic Matter / Advanced: Soil Organic Carbon. SOM is a good indicator for soil fertility and is typically measured in commercial soil tests. SOC requires use of an elemental analyzer and is better for measuring changes in soil carbon stocks.
- Basic: Standard nutrient testing (pH, NPK, CEC, salinity as needed).
- Advanced: Aggregate stability – this is a good measure of structural health.
- Advanced: Water holding capacity – this is important for yield resilience. Consider that it is measured in different ways and may be difficult to compare across labs.

Biodiversity and Habitats: At a basic level, measuring the absolute and proportional area of natural and semi-natural habitat on each farm is a good first step. However, landscape configuration, habitat connectivity, and crop diversity are also important factors affecting biodiversity conservation. KPIs should also include measures that would provide insight into the enabling conditions for biodiversity action, for example, the prevalence of land ownership within a sourcing region.

- Average field size
- # of crops grown
- Absolute and proportional area under agroforestry or silvo-pasture
- # of varieties grown for major crops within a specific time frame
- Total area in native and semi-native habitat
- % total riparian area with vegetated buffers

Yield improvement vs. stability: regions vary widely in their average yield for a given crop. In areas of already high productivity, reducing yield variability may be a more appropriate goal than just increasing average yields. In smallholder systems, increasing yields and reducing crop contaminations (e.g., mycotoxins) and loss in storage are also important goals.

Including relevant KPIs, targeted as appropriate to smallholders, commercial farmers, or both is recommended.

Fertilizer productivity: a good integrated soil fertility management approach includes organic inputs and is based on macro-and micro-nutrient requirements: this helps to define the right total quantity. However, maximizing Nutrient Use Efficiency (NUE) may not capture water pollution caused by poor nutrient management. In many dairy systems, management of manure resources is critical to avoid overapplication of phosphorus while meeting nitrogen goals.

It is recommended to include KPIs on nitrogen and phosphorus use efficiency (NUE/PUE) based on all nutrient sources (fertilizer, manure, compost, mulch) and establish target ranges that are based on scientific literature and local knowledge (values of 0.5-0.8 are viable in many systems). NUE and PUE are effective proxies for nutrient losses to waterways and risks of water pollution.

Tools and information sources recommended by TNC

Depending on the specific objectives of a local regenerative agriculture initiative, the below tools and information sources can be helpful and provide further guidance for a stronger impact. In addition, we encourage exploration of local resource and education materials on these topics, as it suits by design the local context.

Soil Health Measurement

- Soils Revealed: https://soilsrevealed.org/ - global maps of soil organic carbon trends, predictions. This tool maps areas of opportunity for soil restoration and carbon storage.
- Several free tools are available for designing soil sampling campaigns, including Stratifi (v3.1)
- Soil Health Institute Resource Library: https://soilhealthinstitute.org/resources/ - database of scientific research, tools, and educational materials related to soil health.

Watershed context

It is recommended to provide guidance to suppliers on how to define KPIs and targets based on local water risks. Markets may adopt locally relevant tools such as the Nutrient Tracking Tool (available in much of the US), ANCA in the Netherlands, etc. Global tools such as RUSLE can be used to estimate erosion from water runoff.

Biodiversity Action Planning

- Biodiversity Action Areas: In alignment with the Science Based Targets Network (SBTN) guidance, TNC has developed a framework for identifying and managing areas of high value for biodiversity conservation in agricultural landscapes. Biodiversity Action Areas are used as an input to regional and site specific action plans. TNC's partners can make progress towards managing the negative impacts of agricultural land uses on biodiversity and water security.
- Agrobiodiversity Index: methodology for measuring the current state of agrobiodiversity in markets and agricultural production. Guidance provided to the public by CGIAR through the CGSpace.
- Tools like the USDA's AgBufferBuilder can aid farmers in design of functional farm landscapes, while tools like Buffer$ provide a simple method of analyzing the cost and benefits of installing conservation buffers on-farm.
- The Nature Conservancy's Edge of Field Roadmap: https://nature.org/edgeoffield - Roadmap for advancing edge of field practices that benefit water quality, soils, and biodiversity. The roadmap was created for the U.S. context, but the priority practices outlined within the report are applicable in many geographies.

Agricultural Practices Support & Evidence Databases

- TNC's Ag Evidence tool: https://www.agevidence.org/ - It visualizes the impacts of regenerative or conservation agriculture practices on key outcomes like nutrient runoff, GHG emissions, crop yields, water quality and soil health in the Midwestern US. This can be used on reference farms to choose regional priority practices.
- Crop sequence calculators and guidance. For example, those provided by the USDA Agricultural Research Service's Crop Sequence Calculators and Sustainable Agriculture Research and Education's (SARE) regionally-adapted rotation sequence examples.
- Midwest Cover Crops Council's Cover Crop Decision Tool matches potential cover crops with specific cash crop

rotations within a regional context.

- 4R Nutrient Stewardship Training & Certification: https://nutrientstewardship.org/4rs/ - program to advance nutrient stewardship. Training modules available on the website in addition to in-person certification options. A 4Rs manual is also provided by the International Plant Nutrition Institute at https://www.ipni.net/4r
- Smallholder systems: There are many existing efforts to promote sustainable and regenerative agriculture in smallholder systems that Nestlé can draw on to support the implementation of the Regen Ag Framework. One example is the work of the global development organization, Digital Green, which delivers innovative digital solutions for connecting farmers for peer-to-peer learning, providing training and agronomic advice, and farm data management. Another example specific to the topic of nutrient and pest management is the work of Agrocares, which provides data-driven tools to support precision farming in smallholder systems. Their technology is intended to be affordable and reliable in remote areas. Their line of SoilCares tools provides rapid, low-cost soil testing for monitoring soil health.

Responsible Pest Management Framework

There are precompetitive efforts to define indicators and improve measurement of integrated pest management. One existing effort is the Responsible Pest Management (RPM) Framework that is organized by The Sustainability Consortium. The framework aims to provide an innovative, science-based approach for measuring responsible pest management. It outlines a set of practices and decisions made on-farm that contribute to four major outcomes: long-term system resilience, environmental stewardship, optimal production, and human/animal health. The RPM framework could serve as a starting point for Nestlé as it develops IPM programs for its regenerative agriculture programs.

ANNEX 3

List of international tools and information sources recommended by TNC

Tool	Owner	Focus area	Content
Soils Revealed		Soil	Global maps of soil organic carbon trends. Maps opportunities for soil restoration & carbon storage.
Responsible Pest Management Framework	The Sustainability Consortium	Biodiversity & Pest Man.	Science-based approach for measuring responsible pest management
RUSLE		Soil & Water	Estimate erosion from runoff. Guidance how to develop KPIs based on local water risks
AgEvidence	TNC	Regen Ag Practices	Data visualization from a regional analysis of the impact of conservation ag practices on climate mitigation, crop yields, soil properties, nutrient runoff and water quality.
Stratifi		Soil	Designing soil sampling campaigns
Biodiversity Action Areas	TNC	Biodiversity	Process for identifying and managing areas of high value for biodiversity conservation in agricultural landscapes
AgroCares	Agrocares	Smallholder precision farming	Support precision farming in smallholder farming systems
SoilCares	Agrocares	Soil	Low-cost soil testing for monitoring of soil health parameters
Nutrient Tracking Tool		Soil	Guidance how to define KPIs and targets based on local water risks (nutrient runoff)
Soil Health Institute Resource Library		Soil	Database of scientific research, tools, and educational materials related to soil health
CGSpace	CGIAR	Biodiversity	Agrobiodiversity Index: methodology for measuring the current state of agrobiodiversity in agricultural production
Edge of Field Roadmap	TNC	Biodiversity	Edge of field practices that benefit water quality, soils, and biodiversity
4R Nutrient Stewardship Training	Nutrient Stewardship	Regen Ag Practices	Certification and program to advance nutrient stewardship
4Rs manual	International Plant Nutrition Institute	Regen Ag Practices	Manual of 4R integrated nutrient management

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